

- **Membrane module for cleaning membrane filtration modules, comprises porous membranes, and a venturi device for providing entrained gas bubbles in a liquid flow which then passes through the membrane.**

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US 2001047962 A1 Cont of WO 1999-AU817 19990924, US 2001-815966 20010323;
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NOVELTY - A **membrane module** (5) comprises porous
membranes (6) arranged in close proximity to one another and
mounted to prevent excessive movement, and a venturi device (12) for
providing, from within the module, gas bubbles entrained in a liquid
flow. The entrained liquid and gas bubbles
move past the surfaces of the **membranes** to dislodge fouling
materials.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:

(a) scrubbing method of a **membrane** surface using a liquid
medium with gas bubbles entrained, including entraining the gas bubbles
into the liquid medium by flow of the liquid medium past a source of gas,
and flowing the gas bubbles and liquid

medium along the **membrane** surface to dislodge fouling materials;

(b) method of removing fouling materials from the
surface of porous hollow fibers mounted and extending longitudinally in an
array forming a **membrane module** as disclosed above;

(c) a **membrane bioreactor** including a tank which have the
membrane module as disclosed above; and

(d) method of operating a **membrane bioreactor** stated above
by introducing feed into the tank, applying vacuum to the fiber while
supplying gas bubbles.

USE - The **membrane module** is used for cleaning
membrane filtration modules, and is also used in a
membrane reactor.

ADVANTAGE - The advantages of the invention are:

(i) By using a venturi device, it is possible to generate gas bubbles to scrub membrane surfaces without the need for a pressurized gas supply;

(ii) The liquid and the gas phases are well mixed in the venturi and then diffuse into the membrane module to scrub the membranes. Where a jet type device is used to forcibly mix the gas into the liquid medium, a higher velocity of the bubble stream is produced. In treatment of wastewater, the thorough mixing provides excellent oxygen transfer;

(iii) The flow of gas bubbles is enhanced by the liquid flow along the membrane resulting in a large scrubbing shear force being generated, providing a positive fluid transfer and aeration with the ability to independently adjust flow rates of gas and liquid;

(iv) The injection of a mixture of two-phase fluid into the holes of the air distribution device can eliminate the formation of dehydrated solids and prevent gradual blockage of the holes;

(v) The injection arrangement provides an efficient cleaning mechanism for introducing cleaning chemicals effectively into the depths of the module while providing scouring energy to enhance chemical cleaning;

(vi) The module configuration allows higher packing density in a module without increasing solid packing. This adds an additional flexibility that the membrane modules can either be integrated into the aerobic basin or arranged in a separate tank;

(vii) The positive injection of a mixture of gas and liquid feed to each membrane module provides a uniform distribution of process fluid around membranes, thus minimizing the feed concentration polarization during filtration;

(viii) The filtration efficiency is enhanced due to a reduced filtration resistance; and

(ix) The cleaning method can be used to the treatment of drinking water, wastewater and the related processes by membranes.

DESCRIPTION OF DRAWING(S) - A schematic side elevation of the membrane module.

Membrane module 5

Membranes 6

Venturi device 12

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